Precalc Warm Up #5-2

1. Sketch, and state domain and range.
   $x^2 - 6x + y^2 + 10y + 18 = 0$

2. Sketch, and state domain and range.
   $f(x) = \sqrt{x - 4}$

HW Questions:

EXERCISES 6.1

1. Find the equation of the given relation under the translation indicated.

(c) $y = x^2 ; \begin{pmatrix} 0 \\ 5 \end{pmatrix}$

(f) $x^2 + y = 2 ; \begin{pmatrix} 0 \\ -2 \end{pmatrix}$

(i) $x^2 + y^2 = 4 ; \begin{pmatrix} -1 \\ 0 \end{pmatrix}$

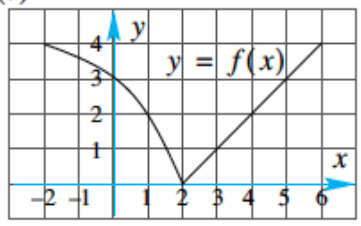
(l) $x + y^2 = 4 ; \begin{pmatrix} 4 \\ 0 \end{pmatrix}$

$(x-4) + y^2 = 4$

$x + y^2 = 8$

2. Consider the graphs shown below.

(a)



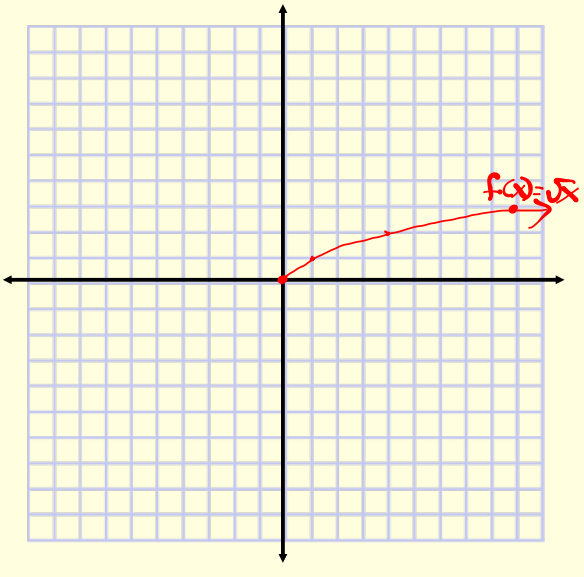
In each case, sketch the graph of

i. $y = f(x+2)$ ii. $y = f(x-1)$

iii. $y = f(x)-3$ iv. $y = f(x)+1$

3. Using translations on the graph of $f(x) = \sqrt{x}$, sketch the graph of the following

(c) $y = f(x-2)+3$

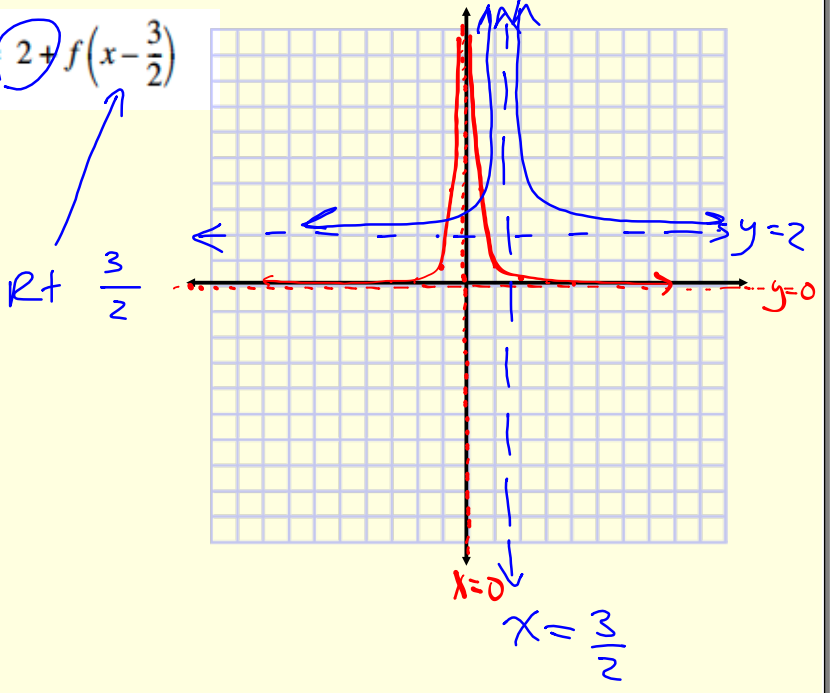


4. Using translations on the graph of $f(x) = \frac{1}{x}$, sketch the graph of the following

(c) $y = f(x+2) - 3$

5. Using translations on the graph of $f(x) = \frac{1}{x^2}$, sketch the graph of the following

(c) $y = 2 + f\left(x - \frac{3}{2}\right)$



6. On the same set of axes sketch the graphs

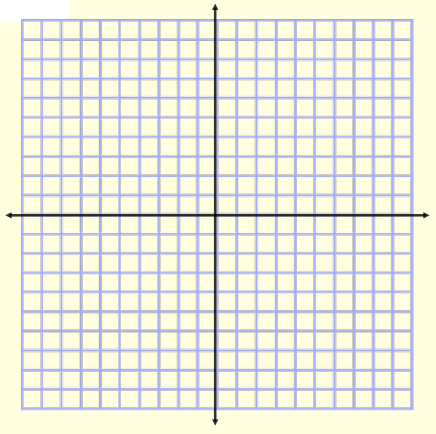
(a) $y = x^2 - 4$ and $y = (x-4)^2$

(c) $y = x^2 + 2$ and $y = x^2 - 2$

(e) $y = x^3 - 8$ and $y = (x-8)^3$

(g) $y = \dfrac{1}{(x-2)}$ and $y = \dfrac{1}{x} - 2$

(i) $y = \sqrt{x-2}$ and $y = \sqrt{x} - 2$



7. Sketch the graph of the following functions, making sure to include all axial intercepts and labelling the equations of asymptotes (where they exist).

(a) $y = (x-2)^2 + 3$

(d) $y = \dfrac{1}{x-2} + \dfrac{1}{2}$

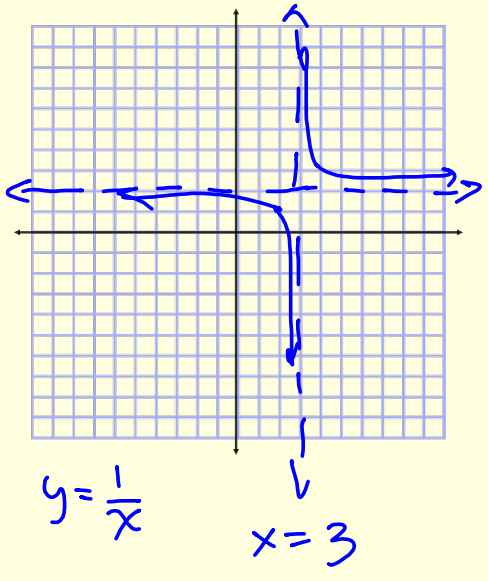
(g) $y = \sqrt{x-2} + 2$

(j) $y = 1 + \dfrac{1}{3+x}$

(m) $y = 2 - \dfrac{1}{3-x}$

$-(x-3)$

$2 + \dfrac{1}{x-3}$



9. Express, in terms of $f(x)$, the transformation(s) required to map $f(x)$ to $g(x)$.

(a) $f(x) = x^2$, $g(x) = x^2 - 2x + 2$

(b) $f(x) = x^2$, $g(x) = x^2 + 4x$

$g(x) = x^2 - 2x + 1 + 2 - 1$

$g(x) = (x-1)^2 + 1$

R + 1 up 1

$g(x) = f(x-1) + 1$

$g(x) = x^2 + 4x + 4 - 4$

$= (x+2)^2 - 4$

b) $g(x) = f(x+2) - 4$

Order of transformations matters!

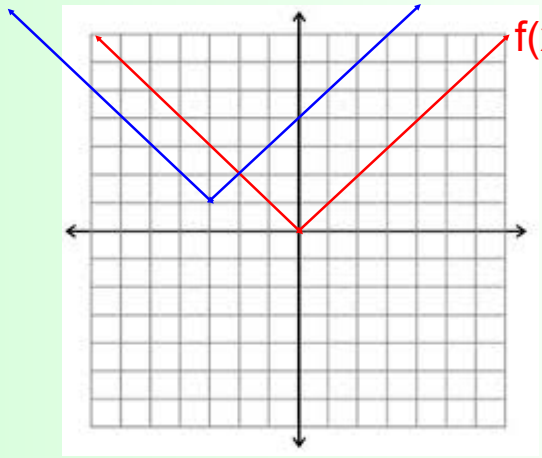
1. Dilations: changes the shape d:
2. Reflections r_y or r_x r:
3. Shifts or Translations. s:

Notice you do them in alphabetical order :)

Graph t(x) = |-x - 3| +1

$|-(x+3)| + 1$

If f(x) = |x|, then t(x) =



f(x) = |x|

d: ~~∅~~

r: r_y

s: $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$

Graph t(x) = |-x - 3| +1

last

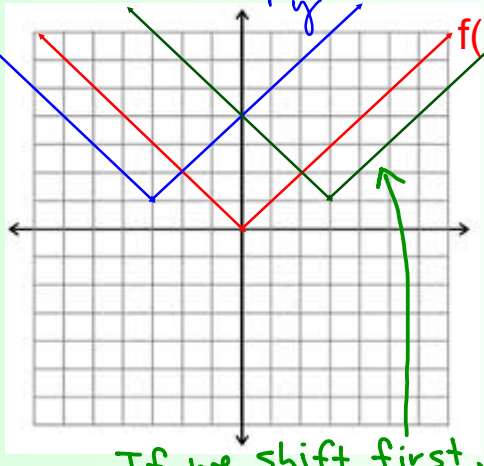
$= |-(x+3)| + 1$ ⟵ up 1

left 3

If f(x) = |x|, then t(x) =

t(x)

r_y



f(x) = |x|

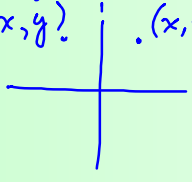
d: ∅

r: r_y

s: $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$

r_y

$(-x, y)$ (x, y)



If we shift first, then reflect we get the wrong graph

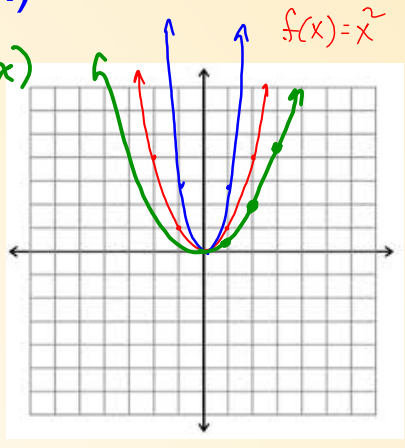
Non rigid Transformations

How does $h(x) = 3x^2$ compare to $f(x) = x^2$?

$$h(x) = 3f(x)$$

$h(x) = a \cdot f(x)$
"a" is the
vertical stretch or
compression

$= \frac{1}{2} f(x)$



$a > 1$ stretch

$0 < a < 1$ "shrink" → compression.

How does $t(x) = 4|x + 2| - 3$ compare with $f(x) = |x|$?

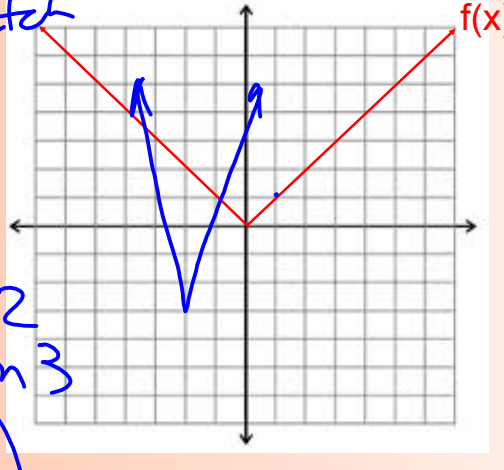
$$t(x) = 4f(x + 2) - 3$$

d: Vertical stretch of 4

r: ∅

s: left 2 down 3

$\begin{pmatrix} -2 \\ -3 \end{pmatrix}$



What if the number were multiplied on the INSIDE?

Graph $c(x) = (3x)^2$

If $f(x) = x^2$,

then $c(x) = f(3x)$

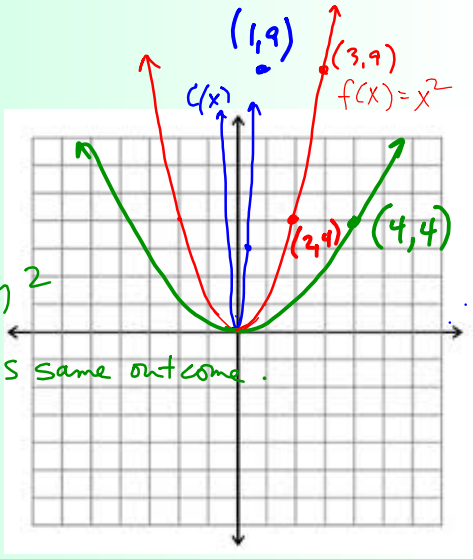
horizontal compression by $\frac{1}{3}$

$t(x) = f(\frac{1}{2}x)$ horizontal stretch by 2

for $x = 2$, $t(x)$ stretches it by 2 so that $x = 4$ gives same outcome.

$h(x) = f(ax)$

horizontal compression (shrink) of $\frac{1}{a}$



Graph $r(x) = |2x - 8| + 1$

If $f(x) = |x|$, $|2(x-4)| + 1$

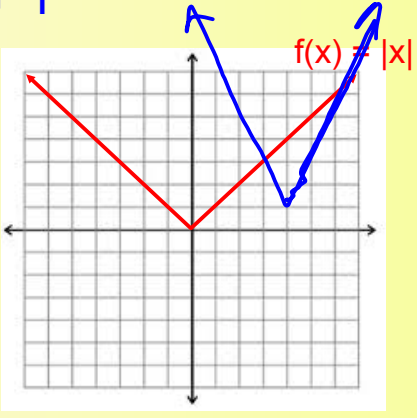
then $r(x) = f(2x-8) + 1$

d: horizontally compressed by $\frac{1}{2}$

r: ∅

S: Rt 4 up 1

$\begin{pmatrix} 4 \\ 1 \end{pmatrix}$



Describe the graph of $f(x) = -(5x - 10)^2 + 4$

$= -[5(x - 2)]^2 + 4$

If $g(x) = x^2$, then $f(x) =$

on outcomes so r_x

d: horizontal compression of $\frac{1}{5}$ ($\frac{1}{5}$ times the x's)

r: r_x $\quad f(x) = -g(5(x-2)) + 4$

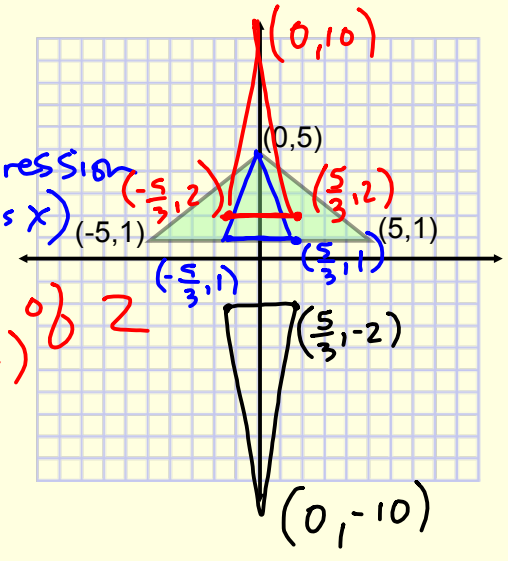
S: $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$

Consider the relation shown below

Graph y = -2 f(3x)

d: { horizontal compression of $\frac{1}{3}$ → ($\frac{1}{3}$ times x)
vertical stretch of 2 (y's times 2)

r: r_x

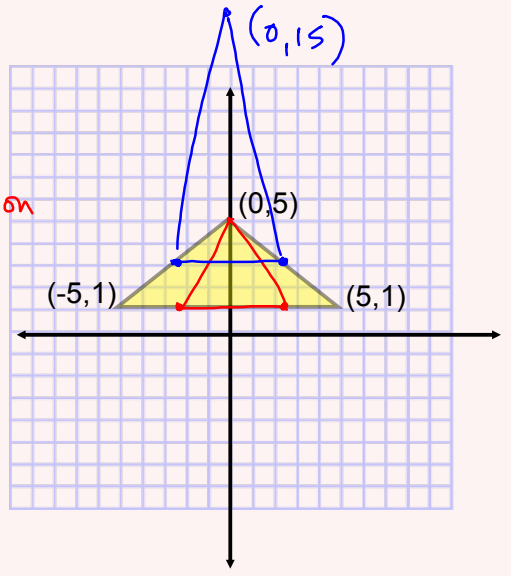


Graph y = 3f(-2x)

d: horizontal compression of $\frac{1}{2}$ (x's times $\frac{1}{2}$)

Vertical stretch of 3 (y's times 3)

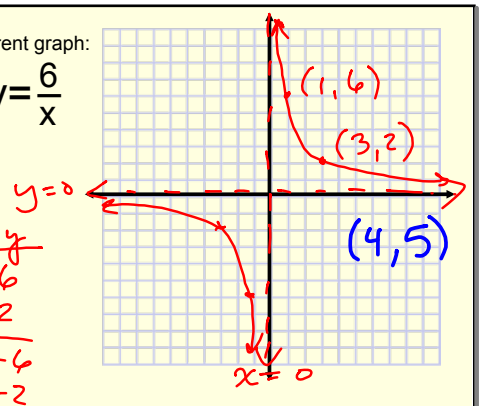
r: r_y



$$f(x) = 3 - \frac{6}{1-x}$$

$-(x-1)$

parent graph: $y = \frac{6}{x}$



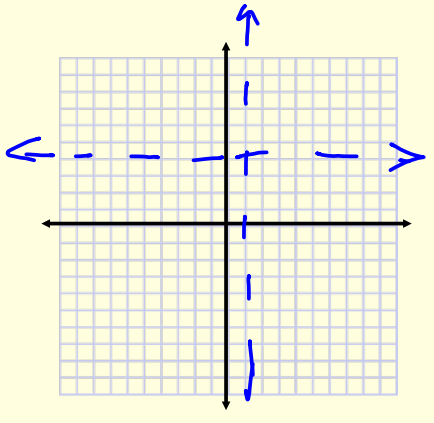
x	y
1	6
3	2
-1	-6
-3	-2

$$f(x) = 3 - \frac{6}{-1(x-1)}$$

Simplify:

$$f(x) = 3 + \frac{6}{(x-1)}$$

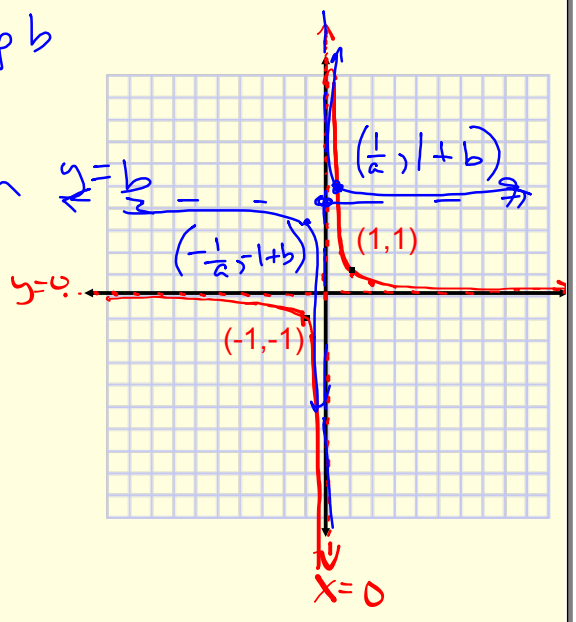
easy



Graph y = f(ax) + b, a > 1, b > 0 relative to $f(x) = \frac{1}{x}$

up b

horizontal compression of $\frac{1}{a}$ (x times $\frac{1}{a}$)



Describe the transformations:

$y = \frac{1}{2}\sqrt{2 - \frac{1}{4}x}$

$\frac{1}{2}\sqrt{-\frac{1}{4}x + 2}$

$y = \frac{1}{2}\sqrt{-\frac{1}{4}(x-8)}$ $\quad -\frac{1}{4}(-8) = 2$

$y = \frac{1}{2}\sqrt{\frac{1}{4}(-1)(x-8)}$

$y = \frac{1}{2}\cdot\frac{1}{2}\sqrt{-(x-8)}$

$y = \frac{1}{4}\sqrt{-(x-8)}$

d: vertical compression of $\frac{1}{4}$

r: r_y

s: Rt 8

HW: SL Book

p. 181 #3a

p. 186 #1c, 3 LC, 5a, 6ab

Quiz Thursday

PC: 2.1, 2.2, 2.4, 2.5

SL: 5.1, 5.2, 6.1, 6.2, 6.3